METHOD OF PROVIDING TRAVEL TIME

CROSS REFERENCES TO RELATED APPLICATIONS

Not applicable.

STATEMENT AS TO RIGHTS TO INVENTIONS MADE UNDER FEDERALLY SPONSORED RESEARCH AND DEVELOPMENT

Not applicable.

BACKGROUND OF THE INVENTION

The present invention relates to systems for predicting travel times between locations in general and more particularly relates to systems which provide information about traffic based on real-time and historic traffic data over the Internet.

Recently, many traveler information systems have been developed to inform travelers with regard to real-time traffic information. Examples of such traveler information systems can be found in several major traffic information websites, including

SmartRoute Systems http://www.smartraveler.com/ (1998):

Etak http://www.etaktraffic.com/ (1997):

Traffic Station Group http://www.trafficstation.com/ (1998):

TrafficOnline System http://www.trafficonline.com (1996): and

Traffic Assist http://www.trafficassist.com/ (1998).

The travel information systems are based on the availability of reliable computer-based maps and the availability of traffic data, available over the Internet, which are typically supplied by each state's Department of Transportation. Internet provided data includes real-time velocities and the number of vehicles per minute traveling selected roads. Over time such data can also supply historical travel times between selected points. Existing systems display maps which indicate road construction or other incidents and show or predict travel time along particular routes or between selected points.

In addition to companies that provide Internet based traffic reporting and vehicle routing solutions, many other institutions, including state departments of transportation (DOT) and city departments of transportation, as well as transportation consulting companies in the US, have deployed their own traveler information systems, which use variable message signs (VMS), travel advisory radios (TAR), TV and cable TV channels, radios, kiosks, telephones, pager, and cell phone to provide traveler information to individual users.

In a typical travel information system, a road map is divided into route segments and historical and/or real-time sensor data is used to predict the time it will take a vehicle to travel along a particular route segment. Predictions of trip travel times are then based on linking together route segments to create routes along which it is desirable to calculate a travel time.

What is needed is a better system for predicting future traffic congestion based on a wider range of data including weather, and known movements to and from special events. Further, a system is needed which takes into account the attributes of the vehicle and driver in predicting trip times.

SUMMARY OF THE INVENTION

The traffic information system of this invention employs a computer model of a transportation route map, the route map having a multiplicity of possible destination points connected by route segments. Each route segment is representative of a particular path between destination points. The path may represent a road segment, but can also be used to represent other transportation links, such as airplane routes, train routes, and water transportation routes. Between any two destinations points there will typically be a number of different routes, each route being made up of one or more route segments. An equation is developed for each route segment. The equation incorporates variables and constants which relate to the fixed and variable parameters which are indicative of the time it will take to travel along a particular route segment. The fixed parameters for a road would include the route segment's length, the posted speed limit, and the carrying capacity of the route segment. Variable factors include the time of day, day of week, day of year, number of vehicles predicted or measured to be moving along the route segment, the measured velocity of the vehicles, the type of driver, and type of vehicle for which a prediction of travel time is desired. In addition, there are variables which adjust the carrying capacity of the route segment, for example lane closures due to construction or accident. The carrying capacity of a route segment as well as the maximum speed will also be dependent on weather, and other factors affecting visibility.

The number of vehicles using a given route segment will in the short run depend on the number of vehicles on other route segments which supply traffic to the different route segment. Longer-term prediction of vehicle traffic will be based on historical data and on data concerning future construction on alternative routes, and planned events which will increase traffic along the route segment.

The capacity of a route typically remains constant, until the occurrence of a predictable event, such as construction, and adverse weather, or is reduced by an unpredictable event such as an accident.

Uncertainty with respect to the time required to transit a route segment relates to the unpredictability of the future and the imperfection of knowledge about the current situation. Predictions based on a given confidence level will produce a range of trip times which will reflect the type of uncertainty and its magnitude. Future predictions of weather are given in probabilistic terms and therefore result in probabilistic predictions of future transit times.

It is an object of the present invention to provide a traffic information system which provides long-term predictions of time to transit particular route segments and multiple route segments.

It is a further object of the present invention to provide a traffic information system which can predict route segment speeds based on predicted weather.

It is another object of the present invention to provide a traffic information system which provides an estimate of the uncertainty, presently estimated or future predicted, for travel time along a route segment.

It is a yet further object of the present invention to provide a traffic information system which provides an estimate of travel time over route segments which considers the type of vehicle and the type of driver who is traversing the route segments.

Further objects, features and advantages of the invention will be apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates the system architecture of the Internet-based traffic prediction system of this invention.